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DRAWINGS ATTACHED

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(54) FASTENING MEANS ADAPTED FOR USE IN A DRIVING TOOL

(71) We, BUKAMA GmbH. HANNOVER, a German Limited liability company of 19 Carl-Zeiss-Strasse, 3005 Hemmingen-Westerfeld, Federal Republic of Germany, do hereby declare the invention, for which we pray that a Patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

This invention relates to fastening means, such as nails and staples for example, which are adapted for use in a driving tool equipped with a magazine for storing said fastening means, an output channel and a driver for driving said fastening means.

Fastening means which are driven by a driving tool into a workpiece are guided in the output channel of the tool during the driving operation, the channel having the same cross section as the fastening means. However, the guidance necessary to effect faultless driving operation is not present when the fastening means is provided with an enlarged head (as in the case of headed nails, for example) since the cross-section of the output channel corresponds to the shape of the head of the fastening means and hence cannot ensure adequate guidance to the shaft. Therefore the fastening means can easily assume an oblique position in the output channel so as to jam or to be driven in a slanted manner.

Attempts have been made to guide the shaft of headed nails by means of a funnel-type centering piece mounted in the lower part of the output channel; however such a centering piece is subject to rapid wear. Moreover a funnel type centering piece of this kind can only be mounted underneath the inlet aperture of the feed magazine attached to the driving tool, so that the length of the output channel is correspondingly increased; or alternatively the centering piece must be slotted on the inlet aperture of the magazine. With these means, however, it is not possible to ensure safe guidance of the shafts of headed nails or similar fastening means.

Generally, fastening means for use in driving tools are assembled in large numbers to form a strip which is inserted in the magazine communicating with the output channel. With fastening means wherein both heads and shafts have the same width (such as staples, tacks or pins, for example) the strip or bar inserted into the magazine is customarily held together by agglutinants. If the head is of greater width than the shaft (as is the case with nails having disc-shaped heads) the shafts have a greater space between them on account of the heads and in such cases it has become common practice to glue the individual nails onto a strip of paper or plastics material. It is also known to insert the shafts of headed nails into perforated or slotted strips made of paper or plastics material.

Nails of plastics material or nails provided with a plastics head are often joined during the manufacturing process to form strips by providing a carrier strip of plastics material on both sides of the head, the heads of the individual nails thus being held at desired distance from each other by means of the carrier strips.

The process of joining the nails by means of agglutinants, or paper or plastics strips renders the operation of driving the fastening means into a workpiece more difficult since remainders of the agglutinants or of the carrier strips settle in the output channel of the driving tool or underneath the driven nail. Furthermore, these remainders project from underneath the head of the nail and become troublesome when the heads of inserted staples or nails are to be covered e.g. with fails, veneers or the like. Moreover the perforated or slotted plastics strips used for joining the nails project cumulatively during each

nailing step from the front part of the magazine and, being rigid, interfere with the performance of the driving tool. In particular, all prior art measures for joining the nail strips present a disadvantage of considerable importance: namely that the shaft of the nail separated from the strip is no longer in guided relationship with the output channel of the driving tool because, as mentioned above, the cross section of the output channel is adapted to the head of the nail.

An important object of this invention is to provide fastening means such as nails and the like having a head of larger cross-section than their shaft, with effective guidance in the output channel of a driving tool.

According to the present invention, fastening means adapted for use in a driving tool equipped with a magazine for storing said fastening means, an output channel and a driver for driving said fastening means comprises a plurality of individual fasteners arranged in a strip, each fastener having a shaft, a head at one end of the shaft, the head having a larger cross-sectional dimension than that of the shaft, and a guide member slidably mounted on the shaft and initially spaced from the head, the guide member having a cross-sectional dimension approximating to that of the head, both the heads and the guide members of the fasteners having connections with the heads and guide members respectively of adjacent fasteners to hold said fasteners in the strip, said connections being shearable by the driver so that the individual fasteners, each with its associated guide member, can be separately driven out of the output channel of the tool, the heads and the guide members guiding the individual fasteners during their passage through the output channel.

The shearable connections preferably comprise webs formed integrally with the heads and guide members respectively.

Preferably the guide member of each fastener abuts and is covered by its associated head when the fastener is driven fully home into a workpiece.

Each fastener may have a plurality of shafts (as in the case of a staple, for example) and the associated guide member is then slidable on both or all of the shafts.

In one embodiment each guide member carries attachment means which initially extends from the guide member to the head of the associated fastener and which, when the fastener is driven into a workpiece, projects beyond the head for use in attaching an additional element (such as a pipe or tube, for example) to the fastener. The attachment means may comprise a pair of resilient arms and the head is preferably formed or provided with openings through which the attachment means projects when the fastener is driven into a workpiece.

The head of each fastener may be formed or provided with a recess to receive the associated guide member when the fastener is driven into a workpiece. The guide member and the recess may have conical edges and the angle of the conical edge of the recess is preferably made larger than that of the conical edge of the guide member, whereby upon being driven into its final position in the workpiece the head can expand relatively to the guide member and cover the latter. The edge of the guide member or the edge of the recess is preferably sharpened and thereby adapted to be driven into the workpiece.

Various embodiments of the invention will now be described in greater detail and by way of example, with reference to the accompanying drawings in which:—

Fig. 1 is a view of a nail strip inserted into the magazine of a driving tool, the strip being shown in a position prior to the driving operation;

Fig. 2 is a fragmentary view of part of Fig. 1 and illustrates the position at the beginning of the driving operation;

Fig. 3 is a fragmentary view generally similar to Fig. 2 but illustrates the position shortly before the end of the driving operation;

Fig. 4 is a sectional view taken on the line IV—IV of Fig. 1;

Fig. 5 is a sectional view taken on the line V—V of Fig. 1;

Fig. 6 is a sectional view taken on line VI—VI of Fig. 7;

Fig. 7 is a sectional view of part of a nail strip;

Fig. 8 is a sectional view of a nail driven into a work piece;

Fig. 9 is a sectional view of a driven nail of a different embodiment;

Fig. 10 is a part-sectional view of a nail having a differently shaped guide member;

Fig. 11 shows the nail of Fig. 10 in the driven condition;

Fig. 12 is a plan view of a strip consisting of two nails as shown in Fig. 10;

Fig. 13 is a side view of a strip of staples;

Fig. 14 is a front view of the strip shown in Fig. 13, and

Fig. 15 is a plan view of the strip shown in Fig. 13.

Referring first to Fig. 1, which shows several nails joined to form a strip, the head 1 of each nail is circular in plan and is of appreciably larger diameter than the nail shaft 2. On each shaft 2 is slidably mounted a disc-like guide member 3 having the same outside diameter as the head 1. The nail heads 1 and the guide members 3 are made of plastics material and are joined by webs 4 and 5 arranged respectively at the lower face of the heads and at the contacting points of the guide members, said webs 4 and 5

having been manufactured integrally with the heads 1 and guide members 3 and in the course of the same die-casting process. The nail strip formed in this manner is inserted into a magazine 6 of a driving tool 7 (operated, for example, by means of compressed air) the driver rod 8 of which is guided in an output channel 9. The nail strip is advanced towards the output channel 9 in conventional manner by a slide 11 under action of a spring 10, the spring exerting a pressure P in the direction of the arrow shown in Fig. 1.

As will be seen from Fig. 5, the output channel 9 is of square cross section and the circular nail head 1 is a snug sliding fit therein.

At the beginning of the driving operation the foremost nail of the nail strip is located above the output channel 9, as is shown in Fig. 1, and is separated from the remaining nails of the strip by the driver 8 during its working stroke, as shown in Fig. 2. A further stage of the driving operation is shown in Fig. 3. At termination of the driving operation the nail is driven by the driver 8 from the output channel 9 into the workpiece (not shown). During the driving operation the nail in the output channel 9 is snugly guided along the centre axis thereof by means of the nail head 1 and the guide member 3, the latter being located near the tip of the shaft 2. Thus the guidance provided for the nail is similar to that given to a cylindrical body and is such that the nail cannot jam or assume a slanted position. In addition, the particular nail which is located (as in Fig. 1) above the output channel 9 is prevented by the webs 4 and 5 from dropping out of the open output channel 9.

The configuration of the nails in the first embodiment of the invention can be seen in greater detail in Figs. 6 to 8, wherein the nails are shown at an enlarged scale.

The nail heads 1 manufactured of die-cast (for example, a coloured plastics) materials are of domed shape and enclose the upper reinforced end of the nail shaft 2, on the lower part of which is mounted the guide member 3 made of the same material.

The bottom plan view presented by Fig. 6 shows that the nail heads 1 are joined at their points of contact by the webs 4 integrally die-cast onto the lower sides thereof. The guide members 3 are similarly interconnected at their contacting points by the integrally die-cast webs 5 (Fig. 7).

The guide member 3 comprises a plane-parallel, circular disc having the same outside diameter D_1 as the nail head 1, as is shown in Fig. 7. The domed nail head 1 is provided on its lower side with a recess 13 appropriately shaped to conform with the configuration of the guide member 3. Said recess 13 has a conical inside border 14 inclined at an angle α_1 towards the radial plane, while the upper side of the guide member 3 is provided with a conical external edge slanted at an angle α_1 towards the radial plane.

During the driving operation the guide member 3 slides upward on the nail shaft 2 as the latter is driven into the work piece, until the member 3 reaches recess 13 of the nail head 1.

In being driven into its final position (Fig. 8) by the driver rod 8, the nail head 1 suffers slight flattening and spreading, whereby its outside diameter is enlarged to the extent D_2. In order that the head 1 should enclose or surround the guide member 3 entirely, it is necessary to form the angle α of the inside edge 14, in its initial position, so as to be commensurately larger than angle α_1 of guide member 3 to an extent such that both angles are the same when the final position of the nail in the workpiece is attained. In this manner it is ensured that the guide member 3 is completely covered and surrounded on all sides by the nail head 1. The border 15 may also be formed to have sharp edges so as to enter the base 16, thereby providing an improved attachment.

Fig. 9 shows another embodiment of nail whereof the head 21 is integral with the nail shaft 22 and is shaped in the form of a plane-parallel disc. A guide member 23 is attached to the nail shaft 22 in like manner as described in the aforementioned embodiment, the lower side of the member 23 having a sharp-edged border 24 so as to serve as a supplementary means of attachment to base 16. The guide member being shaped in such a manner may be employed to advantage, for example, with roofing nails or similar large headed nails.

In the embodiment shown in Figs. 10 to 12 the nail has a head 31 of square configuration with cut off corners and is provided on its shaft 32 with a guide member 33 equipped on its upper side with two resilient arms 34. These arms in the initial position of the guide member 33, as shown in Figs. 10 and 12, respectively engage recesses 35 in the nail head 31. The guide member 33 has the same shape and dimensions as the nail head 31 and provides together therewith, in the same manner as the first embodiment, an exact guidance to the nail shaft 31 when inside the output channel 9 of the driving tool 7.

The final position as represented in Fig. 11 shows the guide member 33 slid to contact the nail head 31 such than its two resilient arms 34 protrude above the nail head 31, thus serving, for example, as a clamp for supporting a cable or tube 36.

Instead of the resilient arms 34, the guide member can be equipped with other and differently shaped extensions.

The embodiment shown in Figs. 13 to 15 employs a staple instead of a nail. The staple has a circular head 41 and two shafts 42, with

a disc-shaped guide member 43 slidably mounted on both shafts 42 and having the same form and dimensions as the head 41. The heads 41 of the various staples are connected to each other by webs 44 and the respective guide members 43 are interconnected by webs 45. Thus the staples, like the nails of the earlier embodiments, form a strip capable of being inserted into the magazine of the driving tool. The staple of Figs. 13 to 15 is exactly guided in the output channel of the driving tool by the head 41 and the guide member 43: that is to say, in a manner exactly similar to the embodiments described above. Similarly, the individual staples may be separated from the strip with the same facility as the headed nails of the earlier embodiments.

It will be apparent that the examples shown above have been given solely by way of illustration and not by way of limitation and that they are subject to many variations and modifications within the scope of the present invention as defined by the following claims.

WHAT WE CLAIM IS:—

1. Fastening means adapted for use in a driving tool equipped with a magazine for storing said fastening means, an output channel and a driver for driving said fastening means: said fastening means comprising a plurality of individual fasteners arranged in a strip, each fastener having a shaft, a head at one end of the shaft, the head having a larger cross-sectional dimension than that of the shaft, and a guide member slidably mounted on the shaft and initially spaced from the head, the guide member having a cross-sectional dimension approximating to that of the head, both the heads and the guide members of the fasteners having connections with the heads and guide members respectively of adjacent fasteners to hold said fasteners in the strip, said connections being shearable by the driver so that the individual fasteners, each with its asociated guide member, can be separately driven out of the output channel of the tool, the heads and the guide members guiding the individual fasteners during their passage through the output channel.

2. Fastening means according to claim 1, wherein the shearable connections comprise webs integral with the heads and guide members respectively.

3. Fastening means according to claim 1 or 2, wherein the guide member of each fastener abuts its asociated head when the fastener is driven fully home into a workpiece.

4. Fastening means according to claim 4, wherein the head covers the guide member in the fully driven position of the fastener.

5. Fastening means according to any one of the preceding claims, wherein each fastener has a plurality of shafts and the associated guide member is slidable on both or all of said shafts.

6. Fastening means according to claim 1, wherein each guide member carries attachment means which initially extends from the guide member to the head of the associated fastener and which, when the fastener is driven into a workpiece, projects beyond the head for use in attaching an additional element to the fastener.

7. Fastening means according to claim 6, wherein the attachment means comprises a pair of resilient arms.

8. Fastening means according to claim 6 or 7, wherein the head is formed or provided with openings through which the attachment means projects when the fastener is driven into a workpiece.

9. Fastening means according to claim 1, wherein the head of each fastener is formed or provided with a recess to receive the associated guide member when the fastener is driven into a workpiece.

10. Fastening means according to claim 9, wherein the guide member and the recess have conical edges, the angle of the conical edge of the recess being larger than that of the conical edge of the guide member, whereby upon being driven into its final position in the workpiece the head can expand relatively to the guide member and cover the latter.

11. Fastening means according to claim 10, wherein the edge of the guide member or the edge of the recess is sharpened and thereby adapted to be driven into the workpiece.

12. Fastening means adapted for use in a driving tool equipped with a magazine for storing said fastening means, an output channel and a driver for driving said fastening means, substantially as hereinbefore described with reference to the accompanying drawings.

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3 SHEETS *This drawing is a reproduction of the Original on a reduced scale*

Sheet 1

Fig.1

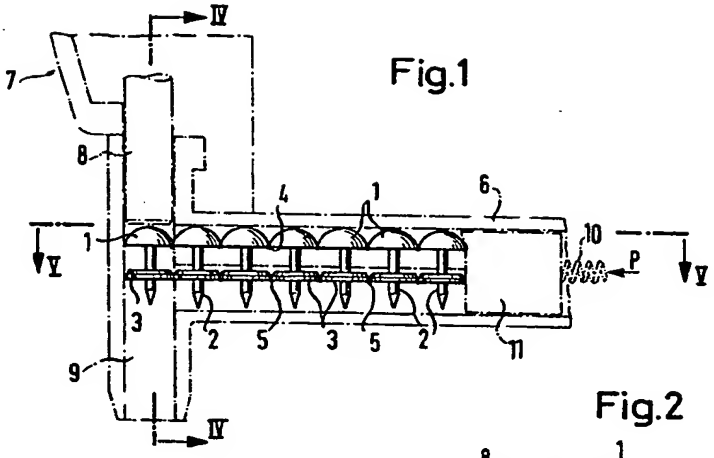


Fig.2

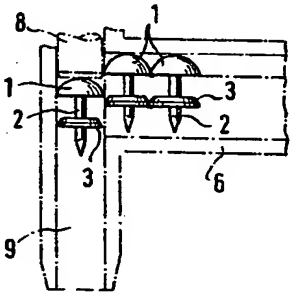


Fig.3

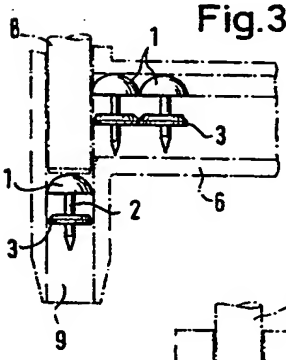


Fig.4

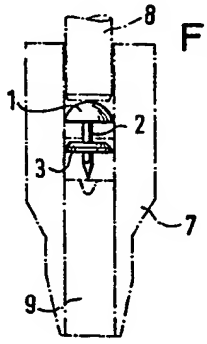
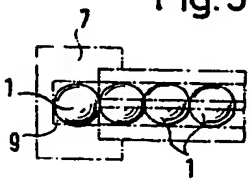


Fig.5



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Sheet 2

Fig.6

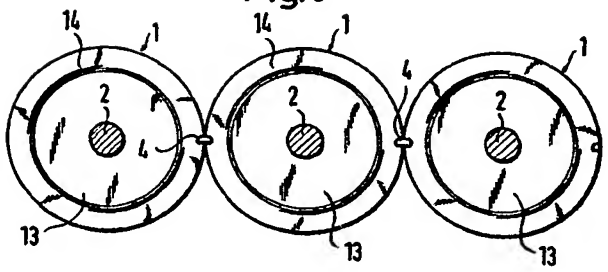


Fig.7

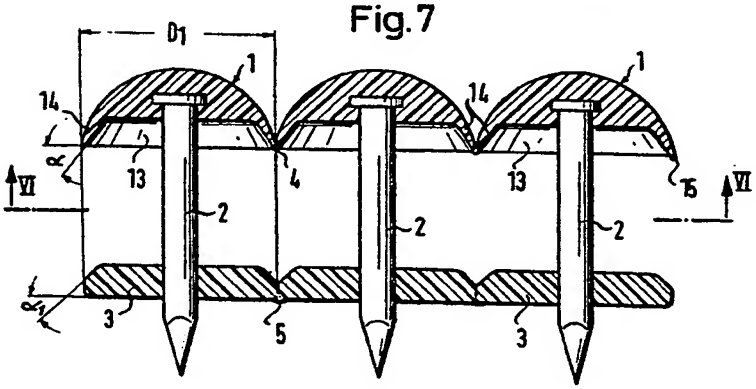


Fig.8

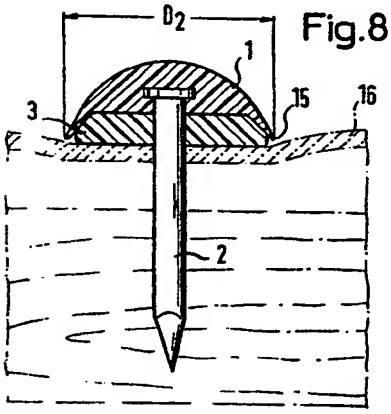


Fig.9

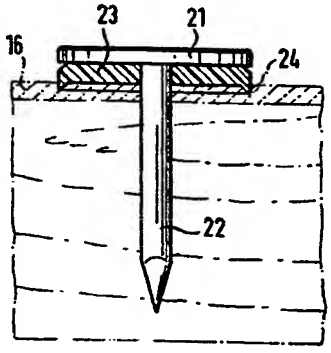


Fig.10

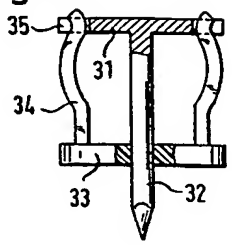
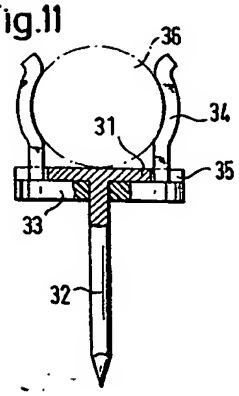


Fig.11



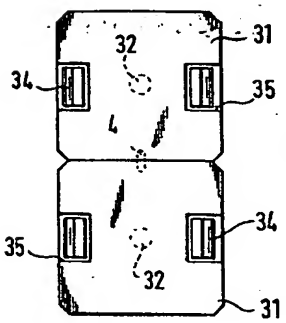
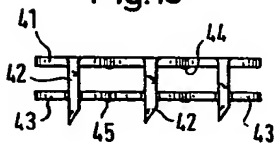


Fig.12

Fig.13



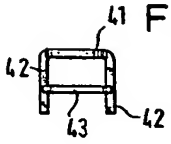


Fig.14

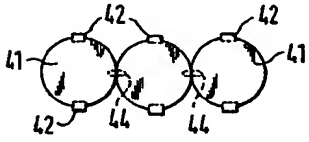


Fig.15